Instructions & Safety Regulations for High Voltage Motors

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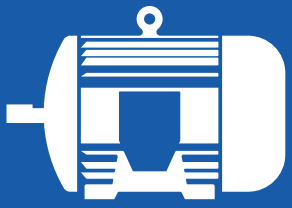

VALIADIS
Hellenic Motors

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VALIADIS S.A.

HELLENIC MOTORS

High Voltage Three-phase Asynchronous Motor

Operation and Maintenance Instruction

ATHENS : *18, Gr. Labraki Str., 141 23 Likovrisi Tel : +30210-2817217, Fax : +30210-2814277*
THESSALONIKI *: INDUSTRIAL ARE OF SINDOS., O.T. 48B, 15η STREET, 570 22*
Tel :+302310–796646, Fax :+302310–796645
e-mail : valiadis@valiadis.gr – http : //www.valiadis.gr
ROMANIA: *1, Aleea Meseriasilor, Bloc C93, Etaj 2, Ap.16, Sector 6, 061647-Bucharest, ROMANIA*
Tel : ++4021 413 5902, Fax: ++4031 815 6441, ++4031 816 5216
E-mail: romania@valiadis.gr -http:// www.ac-motors.eu

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1. Introduction

1.1 General

This instruction is applicable only for the usage and maintenance of high voltage three-phase asynchronous motors produced by VALIADIS S.A.

Please read the documents and nameplate of the machine regarding the basic electric performance parameters of the motor. Please see outline diagram of motor and wiring indication diagram on the lid of junction box of motor, regarding installation, dimensions and interface data of main circuit and auxiliary equipment of motor.

The instruction introduces the installation, usage and maintenance and with aspects related to HV motor in detail. For any further information, contact directly VALIADIS S.A.

1.2 General explanation

1.2.1 The most common structure and installation mode of HV three-phase asynchronous motors produced by VALIADIS S.A. are IMB3, IM7211 and IMV1.

1.2.2 Frame.

According to the installation place and the kind of usage of the motor, for prevention from dust, unwanted matter water etc, of entering into the winding and other electric parts, the frame of the motor is constructed to corresponding protection types, and preventing the operator from touching the electric and rotating parts accidentally. Please see IEC 34-5 about the classification and scope of various frame protection types.

HV three-phase asynchronous motor produced by VALIADIS S.A usually complies to the following protection grade: IP23, IP44, IP54 and IP55.

The motors with special weather protective sign (for example model with suffix W, WF and right) is applicable to outdoor installation.

1.2.3 Cooling

In IEC34-6, specifies various cooling loops and cooling modes of rotating machines. Three-phase asynchronous motors usually comply to the following cooling modes: IC01, IC11, IC21, IC31, IC37, IC81W, IC141, IC151 and IC611.

Signification of common cooling mode sign:

IC01 – self cooling open type, fan is mounted on the shaft

IC611 – whole enclosure fan cooling self ventilation, heat exchanger (air to air) is mounted on the top of motor.

IC81W – air cooling self ventilation, heat exchanger (air to water) is mounted on the top of motor. Water circulation is powered by water pump or water system.

1.2.4 Rotation direction

When the letter sequence (U, V, W or U1, V1, W1) sign of the line and of the motor is same to the letter sequence (A, B, C) of power supply phase sequence. The rotation direction is clockwise viewed from shaft extension end. Switching the wiring of two random phases, the motor will change rotation to counterclockwise.

Note:

a. During running, it is not permissible the motor to reverse or brake by reversely connecting the power supply.

b. The rotation direction of two-pole motor has been set when left the factory (see the rotation indication sign on the plate of motor) and can't be changed at random.

2. Installation and adjustment

2.1 Receiving and conveying

Referring to outline drawing and packing list, confirm the receiving items and check whether the goods are complete.

All hoisting must use suspension rod or hold, never allow to lift or support on iron core lamination or winding. When hoisting the whole motor, should use sling to make the weight balanced and use stay pole to support, preventing so the roof cover or cooler from deforming. During installation a careless, negligently transporting or incorrectly using the suspension rod or sling dog to lift ,may lead to the damage of the motor which becomes larger than of normally running for many years

Note: It is forbidden to hoist the whole motor by the suspension shin on the top cover.

2.2 Storage

2.2.1 General storage

The motor should be stored at a clean and dry place and covered (waterproof, dustproof and anti-corrosive gas etc). If the storage place is cold, humid or with serious temperature variation care to be taken in order the winding temperature of motor is 5℃ higher than the ambient temperature to prevent so from dewing and damping.

2.2.2 Temporary storage

After the motor's arrival and in case of not immediate installation , it should be kept into a clean and dry room without large temperature variation.

2.3 Unpacking

Remove all packages and non-permanent auxiliary devices of motor , clean the dust from the shaft extension and coupler with petroleum solvent. For wound rotor motors, in order to prevent the formation of speckles on the contact surface of slip rings, it should be introduced an anticorrosion paper pad in between

slip ring and brush.

2.4 Preparation before installation action(should be checked the following items before installation of the motor)

2.4.1 Confirm the position points on the foundation plate in order to find out the central line of the units and the elevation of foundation surface.

2.4.2 Check the foundation according to related outline installation drawings of the motor to confirm the silo (if any), cable, cable conduit, bus or needed ventilation duct,that they are complete and on the proper position, and there is enough space to install the units and its accessories.

2.4.3 Check the dimensions and position of foundation bolt and elevation of bolt top in accordance with related outline drawing of motor.

2.4.4 Prepare enough pallets and spacers for leveling to ensure no deformation when placed on the bottom plate and under frame.

2.4.5 Electric welding equipment must be solidly earth grounded. Do not use motor, coupling, pulley or motor base as a current path. Serious bearing and insulation damage may result.

2.5 Positioning: (when decision of motor's position has been made, then the following should be considered.

2.5.1 The motor should be installed on a place with access to best ventilation.

2.5.2 Note that air outlet of the motor should not be discharged as hot air into the air inlet to circulate again, or the discharged hot air from one motor directly to enter into another motor.

2.5.3 Ensure there is enough working space around the motor for easy access to dismantle, clean up or check.

2.5.4 For installation of motors with sleeve bearings and oil rings, the shaft should be alined strictly in horizontal position to avoid oil leaking and ensure the normal running of oil ring.

2.6 Foundation

2.6.1 The foundation must be rigid in order to minimize the vibration of motor and misalignment of the shaft when running.

2.6.2 The dimensions of foundation must be 1.1 times larger than the projection dimensions of the motors.

2.6.3 The foundation should have rigid concrete pier with enough depth on the rigid ground. If the motor has to be placed on a steel frame, and not on the concrete foundation, the girder frame must have enough rigidity to ensure the normal running of motor and to avoid resonance fields.

Note: one of the common reasons of a motor's vibrations is that no thorough study has been carried out for the design of a steel frame foundation.

2.6.4 Bottom face of motor should be placed on the steel spacer or pallet. The top face of steel spacer of pallet must form a horizontal plane whose elevation is slightly lower than the elevation value of the

maximum distance from the central line of motor shaft to bottom face. Before placing the under frame or bottom face into the concrete foundation, top face of foundation should be made rough and flushy.

2.6.5 The grouting layer of foundation must be implemented strictly as per requirements to ensure that the foundation is solid.

2.6.6 The rigidity of foundation and the precision of contact face between bottom of motor and foundation are affecting directly the degree of motor vibration.

2.7 Installation procedure

2.7.1 Apart of any other special requirements when ordered, usually the ambient temperature doesn't exceed 40℃ and altitude above sea level doesn't exceed 1000m. Don't allow to install the open type motor on a dangerous flammable and dusty area.

2.7.2 The spacer width should at least be same to the width of bottom support face of motor, and proper hole should be opened on the spacer to keep off the bottom bolt.

2.7.3 After the motor arrives at the designated position, 8 adjustment nuts should be welded on the upper pallet around the motor. Adjust the front and the back and the right and left of the motor by the adjustment bolts, then use the set screw on the bottom of the motor to adjust the height. After the motor is centered completely, check the installation gap between the motor and foundation. Use the gap gauge to measure and record the size of gap on each place, mark inserted length of gap gauge ,(usually don't consider the gap less than 0.05mm). Make various spacers according to measured dimensions with lengths of about 15mm longer than the inserted depth of gap gauge. Insert the made spacer into related position tightly, bend the exceeding part upwards close to the motor base and mark indelibly the inserted depth figure on the base. After piling up to a certain height by multilayer thin spacers, then replace them with a single spacer of the same thickness.

2.7.4 When the base or foundation of the whole set equipment of the motor is completed, and if the motor is equipped with roller bearing, the coupler,can be used for alignment. If the motor is equipped with sleeve bearing, when barring, it should be taken into account that the motor has axial gap preventing so the axial thrust of damaging the motor.

2.7.5 The centering between the motor and driven machine is performed by using the gap gauge to check and adjust the four points, up, down, left and right on back wheel of coupler. The reading of up, down, left and right gaps of coupler should be consistent (or the error not more than 0.04 – 0.05mm). Then together rotate the motor shaft and the shaft of driven machine, 90 degrees in one interval and measure and record four times marks in one revolution. The concentricity between the motor and driven machine can be set up with two dial gauges on one side of the coupler. The two dial gauges separately touch the side close to the back wheel of two half couplers. Adjust the zero position of two dial gauges. Once the dial gauge is fixed, it can't be changed. Turn the motor shaft and the shaft of driven, machine together 360 degrees. The pointers of the two

dial gauges should be same.Repeat for former readings, or else re-check whether the tow dial gauges are steady. If confirmed that they are steady, then it shows that the two shafts aren't eccentric. When the readings on two dial gauges are within 0.04 – 0.05mm, then they are acceptable.

2.7.6 After finishing adjustment, slightly tighten the adjustment bolt around the motor, to prevent the motor from moving. When the bottom bolts are being tightened should be tightenened diagonally and evenly. After final tightening, center once again as per the above method. If no change occurs, then loose completely the adjustment bolts around the motor.

2.7.7 Please see attached operation and maintenance instructions of sleeve bearings as far it concerns installation .Checking of sleeve bearings.

2.7.8 The rotor of a sleeve bearings motor should be placed in the middle of the magnetic circuit (see the nameplate on the motor) or middle position (mechanical center) of axial movement of rotor. If it can not be located the magnetic circuit center, then place the rotor on the mechanical center, since the positioning of the motor has met the requirements of axial moving. Mount and tighten bottom bolt. Check whether the angle and position of the motor are centered. The centering of angle is checked by measuring the gap between couplers planes, by using the gap gauge to measure the top, bottom and two sides of the coupler. All readings are taken from the same radius to shaft center and on a diameter position as high as possible. Then, the two shafts (motor and driven equipment to be turned together around 180 degrees and to be measured the positions of every 90 degrees interval. In this way ensure checking of the angle relation between axes, avoiding any axial extruding position.

2.8 Electrical measurements – insulation resistance of HV motor

2.8.1 The measurement of insulation resistance of HV motor is performed by a 2500V meghometer. When measuring the insulation resistance of embedded type temperature detectors, should use megohm meter not higher than 2500V. When measuring the insulation resistance of motor winding, carry out on actually cold state.

2.8.2 Measurement method: If start and end leads of each winding are led out to the terminal box, separately measure the insulation resistance between each winding and the frame and between each other. If the connection of three-phase winding within the motor is led out with only three terminals, measure the insulation resistance of all windings to the frame. For wound rotor motor, it should be separately measured the insulation resistance of stator winding and of rotor winding. After the measurements, the winding terminals should be discharged to ground.

2.8.3 When the insulation resistance of the stator winding of a motor is measured in hot state, shouldn't be lower than the value resulted from the following formula:

$R = U_N / (1000 + P_N/100)$

Where: R = insulation resistance of winding, in MΩ

U_N – rated voltage of winding, V;

P_N – rated power, kW;

2.8.4 Drying procedure should be followed only when insulation resistance in cold state is less than 100 MΩ or absorption factor is less than 1.2. The motor should be set in operation only when the insulation resistance of the motor is higher than 100 MΩ, or the absorption factor is in acceptable limits according to VDE 0530 and IEC-34, rules .

2.8.5 Only under the condition ensuring the motor is not damped or has been dried out, could be carried out a dielectric strength test of the motor. The accepted voltage value can't exceed 0.75 (2 UN + 1000) volts. In such a case all RTD's should be linked together and connected to ground during this test temporarily. After this voltage withstand test, the windings should be discharged to the ground properly.

3. Connection and start up of electrical equipment

3.1 Connection and setting

3.1.1 The control circuit, overload protection and earthing of the motor should be checked according to the requirements in the specification. There should be special earthing connection on the motor base to protect the safety of the human.

3.1.2 Please see related wiring diagram on the back of the terminal box regarding the connection of main circuit and auxiliary equipment of the motor.

3.1.3 The setting of temperature limit of motor. Alarming temperature of stator winding is at 130℃ and tripping temperature is at 135℃. Alarming temperature of bearing is 90℃ and tripping temperature is at 95℃.

3.2 Initial startup – not coupled to load.

The first time of power on for a new installation, or after an overhaul and shut down for a long time is referred to as the initial startup. We recommend, that when carrying out the initial startup the motor not to be coupled to the driven machine. Before initial startup, the following items should be followed:

3.2.1 Confirm that all installations or maintenance are finished and checked.

3.2.2 Confirm that all temporary supports and cover boards are removed.

3.2.3 Check the bearings to ensure that all the oil storage chambers are filled with correct quantity of lubricating oil to reach proper oil level. If a forced lubricating system is installed, all network of pipes should be cleaned including the inner cavity of the sleeve bearings. Confirm that the kind and quality of lubricating oil are correct, the lubricating oil is filled to proper oil level and the lubricating system is in good running condition. Check the nameplate, with operation and maintenance instructions of sleeve bearings regarding the pressure, quantity and temperature of inlet oil. At starting of the lubrication procedure, the bearing must be

filled properly with oil from the top of bearing, to prevent from damaging the bearing shell since the flingers can't run in synchronism with the shaft.

3.2.4 Check whether the frequency, No of phases and voltage of power supply conform to the values on the nameplate of motor, and whether the fluctuation of voltage and frequency is within the range according to the specified in the standards.

3.2.5 Check whether the outlet wiring connection of motor is correct according to the nameplate and whether the power supply sign and rotation direction of the motor complies to the requirements.

3.2.6 Check whether the slip ring surface of wound rotor motor is affected by rust or oil or dirt and whether the contact between carbon brush and slip ring is good.

3.2.7 Check if all air inlets and outlets of motor are fitted correctly.

3.2.8 Check whether barring has stridulation

3.2.9 If the motor is equipped with current transformers, the secondary side of CTS should be connected to special control equipment or shorted. Never start the motor under an open state of secondary side of current transformer.

3.2.10 Check the power supply voltage, of space heaters as stated in outline drawing and motor's data label.

3.2.11 Push the rotor along the direction of driven equipment to the limit value of axial moving gap. Check that the half coupler of the motor can't touch the half coupler of the driven equipment on limit position. Pay special attention that it must start up without coupling connection. After, restore contact with half coupler.

3.2.12 Confirm that all earthing, overload and over current etc. protective devices, monitoring devices , are set as per the running requirements of the motor and are functioning properly.

3.2.13 Check and confirm that the water supply and oil supply system (if any) are connected properly and all systems are functioning properly. For motors through water and air cooling, pay special attention to check whether the residue gases within the cooler are evacuated by the exhaust valve, and whether the exhaust valve operates correctly.

3.2.14 Power on, and make the motor jog (press the startup control button, then immediately press stop control button) to check the rotation direction of motor. If the actual direction of rotation doesn't conform to the required direction in respect to the load, and rotation direction sign on the motor, then stop the motor and during inertia running of rotor, change the connection of feeders to correct the rotation direction. You can not change the rotation direction of two-pole motor at random.

3.2.15 Restart the motor and put it into operation. Frequently should be checked whether the bearing temperature is normal, especially at the first two hours. During this period of time, in case of a high speed of temperature rise, shows a failure condition of the bearing. The motor should be stopped immediately and

cause of trouble to be diagnosed and eliminated.

3.2.16 After starting up the motor without load, check whether the adjusted magnetic circuit is correct. At any problem, adjust accordingly by checking whether the vibrations of the motor conform to the specified requirements. Adjust well the fitting between master machine and coupler, to ensure that the motor is running centered to its magnetic circuit.

3.3 Initial start up – coupling to the load

3.3.1 Lubricate and assemble the half coupler according to the instruction of coupler manufacturer. After the coupler is fitted hot, cooling measures should be applied quickly to avoid burning of bearing.

3.3.2 Start up the motor in accordance with the attached instruction of control equipment of motor.

3.3.3 If the motor can't turn within 1 – 2 S after the motor is powered, should immediately cut off the power supply. This failure maybe caused by the following reasons:

a. Voltage rating reaching motor's terminals too low.

b. Load torque too high.

c. The load is stalled.(blocked).

d. Not quite tight electrical connection.

e. The combination of above reasons.

3.3.4 If the motor can't reach the full speed, (if runs at a certain lowered rotational speed over 20s, should immediately cut off the power supply). This failure maybe caused by the following reasons:

a. Voltage reaching motors terminals low.

b. Under a low crawling rotational speed, seems that load torque equals the motor torque.(load torque high).

c. The combination of above two reasons:

Note: For 3.3.3 and 3.3.4, the reasons should be analyzed strictly and after taking correcting measures, then restart.

3.3.5 Attention should be paid regarding the motor's vibrations at this time, compared to the ones recorded when motor was uncoupled from load. If the vibrations are quite higher after the coupling, recheck the centering of the mounting as it is stated in the section of ruling out the failures in this instruction.

3.4 Number of startups.

3.4.1 The initial temperature of the motor is the ambient temperature. It is allowed to start for two times successively with normal stalling between the 2 startups.

3.4.2 If the initial temperature of motor is the rated temperature at rated load, then in this condition it is allowed only one startup.

Special note: Overheating and over stress caused by restarting or starting for long time will drastically

shorten the life of stator winding or rotor.

3.5 Maintenance when shut down

3.5.1 If the motor is stopped over one month on its working site and remains on the foundation coupled to the driven machine, it is recommended that the following should be noted and kept.

a. For sleeve bearing motors, the residual oil in bearing should be discharged and replaced with clean anti-rust oil. For the grease of roller bearing, the bearing cover should be opened to check the grease. Check whether needs to be replaced or filled in. Rotate the shaft for several revolutions by hand.

b. In case of humidity at site, the space heater should be powered on and periodically be checked to ensure good working condition. If the motor is not equipped with space heaters, then could be installed several 100W or 150W bulbs within the motor and be powered on, in order to keep the inner humidity lower than the outer humidity.

c. Use anti-rust oil to coat all outdoor installed nude metal surfaces.

d. Before restart the motor, remove the anti-rust layer on surface, discharge residual oil and fill in with clean oil to specified oil level, dismantle all the temporary heating devices mounted within the motor and check for one time in accordance with the checking items related to initial startup in section 3.2.

4. Checking and maintenance.

4.1 Routine checks when the motor runs.

4.1.1 Whether the motor runs under rated load condition. (check for example the fluctuation of voltage frequency, rated current).

4.1.2 Frequently check lubricating system. Check all the oil levels as in oil specifications. Observe through oil ring. If there is oil leaking, should find out the source and repair it. Monitor the color change and pollution situation of lubricating oil. Pay attention to any strange noise or any sudden large vibrations. Quickly diagnose and restore. Check the bearings temperature periodically during continuous running.

4.1.3 Monitor periodically the temperature i.e. the temperature of stator winding, cooling air and bearing. (for example embedded RTD’s).

4.1.4 In a water–air heat exchanger, check whether the water pipe is leaking.

4.1.5 Periodically remove the dust.

4.2 Bearing maintenance.

4.2.1 Rolling bearing.

The bearing of two-pole motor uses the grease for heavy load and high rotational speed. The grease of other bearings uses 3# lithium base grease. Please see the nameplate of motor about the filling period. When the motor is used outdoors, on a dusty or damp environment, the period for filling and discharging oil of bearing should be shorter.

When starting a motor not being used for a long period of time, firstly check the lubrication state of rolling bearings. If remained grease has been dirty or hard, should be cleaned off with gasoline. Fill in the grease housing with new grease whose volume is about 1/3 – 1/2 of its capacity. If the grease is too much, the bearing will be overheated during operation, leading to its decomposition. There is a spare in and out grease pipe on the bearing. The bearing can be filled in with grease and discharged as well without stopping the motor. Pay attention to check whether the grease or oil pipes of filling and discharging are straight and unblocked to ensure the safely running of bearing.

4.2.2 Please see the operation and maintenance instruction of sleeve bearings regarding the maintenance of the sleeve bearing.

The sleeve bearing of a horizontal motor can be end cover bearing, and also can be a seat type bearing.

The motor with vertical sleeve bearing is permitted to undertake the axial force of the rotor.

4.3 Replacement of oil

The replacement of oil is depended on the running time, number of assemlies-disassemblies, running temperature, and of the pollution degree of oil to a great extend. When the oil is seriously turbid or its temperature is suddenly rising due to the external influence, needs also to be replaced.

For self-lubricating (or motor with pressure lubricating bearing), should frequently be checked the running condition of the bearing. If the color of lubricating oil is changed, obviously. indicates a change in the quality and should timely be replaced with new oil. For the motor with self-lubrication, should be paid attention at the oil surface level within the oil cavity. When the oil level is low, new oil should be added.

Under normal conditions, and after the sleeve bearing with self-lubrication completed 4000h, of life, all the oil should be replaced. (shut down when replace). This stipulation is for the aging of oil. Total oil replacement is needed also even if the motor is always in a stationary state.

For the sleeve bearing with forced oil supply (the replacement period of oil should be at 20000h) of running life.

For the high speed motors, total replacement period of oil should be shortened.

4.4 Temperature limit of bearing.

After a period of 2 hours normal running of the motor attention should be paid to whether there is abnormal sound, vibration and local heating phenomena. Frequently check the bearing temperature of motor. The checking of the temperature rising speed of bearing is more valuable than the checking for the actual temperature of bearing. If the temperature rising speed of bearing is too fast and exceeds a certain limit, immediately stop, the motor. The temperature of rolling bearing can't exceed 95℃; housing temperature of sleeve bearing can't exceed 80℃ and outlet oil temperature can't exceed 65℃.

4.5 Cleaning up the carbon dust

For wound rotor asynchronous motor with fixed contact brushes, clean up the carbon dust abraded by the brush once 10 – 15 days to avoid the creepage circuit formed by the carbon dust on the ring surface which may create dangerous flashovers.

4.6 Cleaning up the cooler

The air cooler, should periodically be checked, especialy the ventilation condition of cooling pipes and frequently clean up the dust to ensure the normal cooling of motor.

5. Accessories

5.1 Heater

If the motor is mounted with a heater, it is usually fitted on the bottom of motor base. The components of the heater can be replaced. When the motor is stopped for repair, firstly cut off the power supply of the heater and then allow the personnel approaching the wiring area of heater. During the normal shut down, the heater can be connected to the power supply manually or automatically.

5.2 Temperature detectors

If the motor is mounted with resistance, temperature detectors (usually Pt100), monitoring of the bearing's temperature is obtained by two temperature sensors fitted, one on DE bearing and one on the NDE bearing . The monitoring of stator winding temperature is obtained through temperature sensors PT100, 2 per phase installed in the slots between the top and bottom coils symmetrically 120º apart. The one sensor per phase is used for working condition and the other one is kept as spare.

5.3 Protective device of shock wave

The protective device of shock wave can be especially designed according to the user's technical requirements, including current transformers, surge arresters shock wave capacitors. These devices can be mounted on the motor or independently, and then connected to the network properly. With these devices the motor is protected from line shock, fault on operational switching and lightnings. Periodically check its situation as per related technical specifications of this device.

6. Troubleshooting

It is very important to identify early the abnormal running symptoms and quickly take restoring measures. Its importance is to prevent a small fault from being developed into a serious fault.

The following guide for troubleshooting may help to find out and repair the possible faults. If faults are detected, cut off at first the power supply of the motor.

The following are most frequently met problems, possible reasons and restoration process.

6.1 The motor can't start up.

Startup faults (see Table 1)

Table 1

Fault	Possible reason	Solution
The motor can't start up completely	At least one power supply lead open	Check the inlet and outlet terminal of fuse of power supply
	No voltage	Check the inlet of power supply
The motor has abnormal magnetic noise and can't start up	There is one phase open on stator or rotor	Check the inlet of power supply on both stator and rotor and repair the breaker
The motor can't start up with load but makes high but normal magnetic noise	Too large load torque	Investigate load's rot ability.
	Too large Gd^2 of load	The selection is not correct
	High voltage drop on feeder line	Calculate correct cross section of cable from the power supply to the motor terminals
	The rotor winding and circuit is open (for wound rotor)	Check the rotor circuit
The motor can idle run idle but can't respond when load is applied	After startup one feeder cable of power supply is open circuited	Check the continuity of power supply cables

6.2 Bearing heating

Fault of bearing heating (see Table 2)

Table 2

Fault	Possible reason	Solution
Bearing overheat	Improper lubricating agent	Refer to recommended grease or oil on outline drawing improper quantity of oil
	Improper oil level	Check the oil level
	The oil ring does not rotate	Check the roughness of oil ring and whether the oil guiding groove and oil ring are on straight line
	Too large load	Check the alignment of shafts. Whether there is axial thrust load.
	The bearing surface is rough, the bearing has a deflection with an excessive axial pressure	Check whether the bearing alloy is displaced and whether there is concave point due to corrosion by shaft current. If any concave point found, check the insulation of bearing. Scrape or refit the bearing to adjust the gap of housing. If necessary, polish the axial diameter.

6.3 Oil leakage

Faults of oil leakage (see Table 3)

Table 3

Fault	Possible reason	Solution
Oil leakage	Too large gap between the housing and shaft	Check whether there is leakage on the gap of gasket
	Air breather is jammed	Check whether there is an obstacle.
	Wrong oil quality	Check whether the oil quality is correct as per outline drawing

6.4 Vibration and noise

Vibration and noise (see Table 4)

Table 4

Fault	Possible reason	Solution
Vibrating noise	The rotor is not balanced	Don't connect the motor to load and check again
	The installation isn't firm or the foundation isn't good	Re-tighten the bolt, check spacer and consolidate the installation
	There is friction between components	Eliminate after confirming the position
	Cage bar of rotor is broken	Amplitude of vibration is changed with the time, mostly occurred whether the coupler is fitted badly
	The coupler is not balanced	Check whether the coupler is fitted badly
	The central line of axes isn't centered	Re-center the central line of the unit and of foundation back on the correct plane
	Resonance of support structure of motor	Large vibration on the bottom of motor – it disappears quickly with the change of speed or after the motor is power off
	The shaft diameter isn't round	The vibration frequency is integral multiple of rotation frequency, Repair or replace the shaft

6.5 Insulation resistance

Fault of low insulation resistance (see Tabl5 5)

Table 5

Fault	Possible reason	Solution
Low insulation resistance	Damp dusty, conductive particle or other polluted matters	Clean the motor, clean and dry the motor as per requirement
	Mechanical damage	Check whether there is unwanted matter of too large vibration on the winding support and slot wedge

6.6 Motor is overheated

Fault of motor overheated (see Table 6)

Table 6

Fault	Possible reason	Solution
When idle running the motor is overheated	The connection of stator winding is wrong (for example make star connection method to triangle connection method)	Check the connection method
	Too high power supply voltage	Check the main power supply voltage and no load current
	Can't cool due to the jamming of ventilating channel	Clean the obstacle in the ventilating channel
	The rotation direction of fan is wrong (for the motor with one rotation direction)	Check the fan and its rotation direction
When the motor is with load, it is overheated	Overload of motor	Check the current
	Too high or too low voltage	Check the voltage
	The motor runs with 2 phases	Check the broken point of outlet and inlet lead
	There is friction between the stator and rotor	Check clearance
	Insufficient water flow or locally jammed for the cooler	Adjust the water pressure, water quantity and exhaust
The stator is overheated locally	Turn-to-turn short of stator (some windings are overheated and drone)	Find out the turn-to-turn short windings and repair it

7 Allowable temperatures rising of asynchronous motor

Temperature rising limit of motor K (see Table 7)

Table 7

Position		AC winding of motor with power more than 200kW and less than 5000kW	AC winding of motor with power 200kW and under	Iron core	Slip ring	Sleeve bearing	Rolling bearing
B grade	Thermometer method			80	80	40	55
	Resistance method	80	80				
	Embedded measuring temperature meter method	90					
F grade	Thermometer method			100	90		
	Resistance method	105	105				
	Embedded measuring temperature meter method	110					

Appendix: Drying process of motor

For newly installed motor or restarted motor being a long time in no use, after measuring the insulation resistance and doesn't conform to the requirements, the winding of the motor must be dried out, usually by carrying out one of the following methods on site.

Copper loss heating method:

1. The rotor of motor should be stationary.(blocked mechanically). The stator is connected as per working connection method, rotor winding is short circuited for wound type motor, then apply 10-15% of rated voltage on stator winding (three-phase power frequency AC voltage determined as per related winding connection), until the stator current reaches about 50-70% of it's rated value. In this way the motor is heated due to cooper loss. In order to avoid the damage of brush of wound type rotor, it is recommended that the user should apply the short circuiting links not on the brusholders but directly on the 3 rotor winding outlets leading to the slip rings Fig. 1.

2. For wound rotors also, the voltage could be applied on the stationary rotor and to short circuit the stator winding. Attention should be paid that the inlet voltage of the rotor should be about 10-15% of its rated voltage , the stator current should not reach more than 50-70% of its rated value. Please see Fig. 2.

3. In case of using single phase AC, connect as per Fig.3. The current of the stator winding should not exceed maximum 50-70 % of its rated current. Proper selection of winding series and parallel groups connections in order desired current values to be obtained. When using c or d connection method, the winding terminals fed by the voltage should be periodically interchanged in order the three-phase windings to be evenly heated.

4. During drying, should be recorded the temperature of insulation resistance, of winding and ambient, and even voltage and current. Plot insulation-time curve and winding temperature-time curve. The interval for each recording to be done every half an hour at the beginning, and once every hour after the insulation resistance has reached stability.
5. During drying, the motor should be earthed to ensure safety.
6. During drying, the maximum temperature of winding and iron core of the motor should be controlled

Fig. 1 Electrified heating method of stator

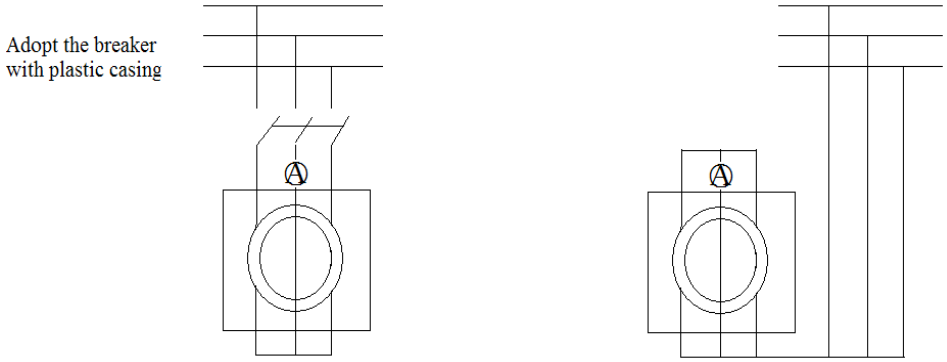
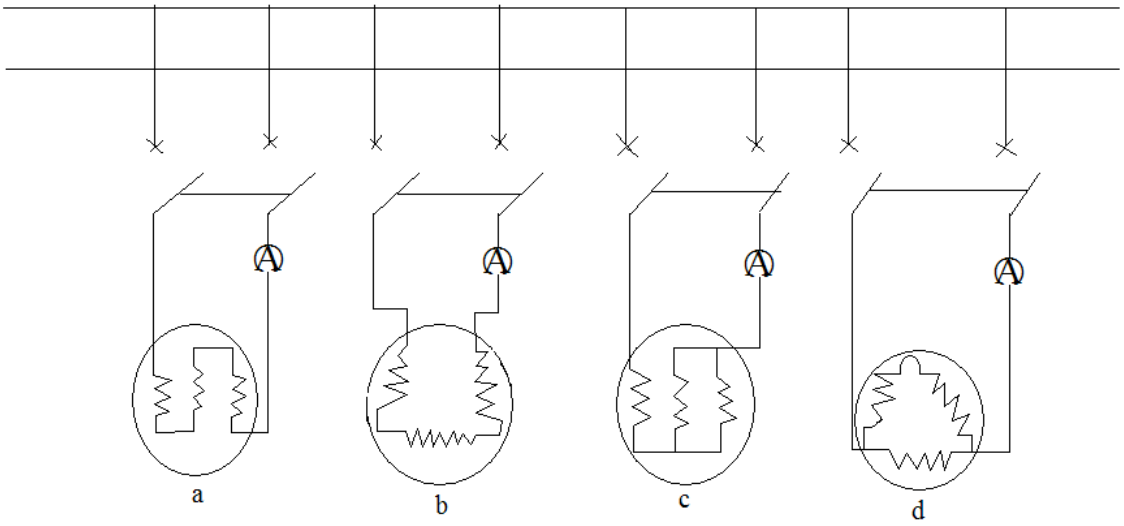


Fig. 3 Heating method by single phase AC



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